

Appl. No.: 10/719,923
Response dated May 30, 2006
Reply to Office Action of Feb. 3, 2006

REMARKS

This is a response to the Office Action dated February 3, 2006. This response is being submitted to place the claims in condition for allowance.

The Examiner rejected claims 1, 12, 16, 18 and 20 under 35 U.S.C. 112, as being indefinite, i.e., as being clear on time limitation of "for around 10-60 minutes". Applicant has amended the independent claims to reflect the time as being 30 minutes, or around 30 minutes.

Next, the examiner was unclear as to which hydrogen was used in claim 12. The hydrogen referenced (10% or less) is the hydrogen that reduces the metal oxide catalyst with inert gas like nitrogen to balance, not for the CO/H₂ mixture.

The Examiner rejected claims 1-4, 6-9, 11, 13-20 and 22-24 under 35 U.S.C 103(a) as being unpatentable over the Rodriguez patent (6,159,538). Applicant acknowledges the rejection by the Examiner and respectfully traverses.

The Rodriguez patent teaches the preparation of carbon nanofibers by utilizing a catalyst, which is a supported catalyst, i.e., metal deposited on the substrate (column 4, lines 53-56 and more clearly described in following lines up to 66). In the present invention, we are using pure metal oxide unsupported catalyst rather than metal salt supported on substrate (column 4, lines 53-66) for the synthesis of carbon nanofibers. In this invention, we are claiming an improvement in the process to make carbon nanofiber rather than a claim for the catalyst. We use the composition to show the flexibility of the process.

The Examiner next appears to make an obviousness argument for claims 9 and 14 for use of eighty percent (80%) H₂ in this invention over Rodriguez. Patent 6,159,538 does not teach nor describe about using large excess hydrogen. Furthermore, we not are claiming using excess hydrogen to prevent any graphite formation on the nanofiber or nanotube.

In claims 15 and 17, we are claiming about the process improvement and shown in figure 1 and figure 2. Figure 1 represents the conventional process developed by Baker & Rodriguez. Figure 2 shows the present invention and the advantages over the conventional process, which as claimed, are not obvious.

The Examiner rejected claims 1-4, 6-11, 13-20 and 22-24 over Rodriguez in view of Takita (6,582,674) under 35 U.S.C. 103(a) as being obviousness. Applicant respectfully

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traverses.

As we mentioned above, the patent to Rodriguez does not render the claims obvious. Additionally, the process of Takita uses pure metal elements with an alkaline metal additive and uses hydrogen to clean up the metal surface rather than using a metal oxide for their purpose. Neither of the patents to Rodriguez nor Takita teaches about the process disclosed and claimed in the present invention. Amount of hydrogen, time of reduction and continued to the production of carbon nanofiber are not taught by these patents. With respect to claim 10, which the Examiner cited as obvious, this is not an optimization of Rodriguez' parameters to obtain Takita's rate to obtain as much product as possible, as both of the patents are two different process with different carbon containing gas and composition.

The Examiner rejected claims 1-4, 6-9, 13-20 and 22-24 over Rodriguez in view of Ono (6,261,532) as obvious under 35 U.S.C. 103(a). Applicant respectfully traverses.

From the personal experience of the applicant, based on literature known, one needs less time for a supported catalyst system (as taught in Ono's patent for Ni/SiO₂ system at a very high temperature using one hundred percent (100%) hydrogen for 120 minutes for preconditioning the catalyst). Ono teaches the time as being about two hours, which is greater amount of time than the thirty (30) minutes now claimed.. So it is not obvious, as the Examiner argued, and moreover, it does not apply for an unsupported catalyst. Rodriguez '583 is silent about the amount of hydrogen, heating rate and effective time for reduction, which are very important parameters for the validation of a process.

In general, the present invention discloses and claims the process to reduce the pre-reduction step for catalyst for nanocarbon synthesis using an unsupported catalyst. No other process is currently known which can reduce the total time of production process by the time we were described in this invention. Therefore, the claims as amended are not rendered obviousness by the prior art patents to Rodriguez, Takita, Ono and Sun.

Applicant respectfully requests reexamination of the claims, and submits that the application is in condition for allowance. A Notice of Allowance is hereby respectfully requested.

Should the Examiner feel that a telephone conference would advance the prosecution of

4 007/007

MAY 30 2006

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this application, he is encouraged to contact the undersigned at the telephone number listed below.

Applicant respectfully petitions the Commissioner for any extension of time necessary to render this paper timely.

The Commissioner is authorized to charge a one month extension of time fee of \$60 to Deposit Account No. 50-0694. However, if this amount is insufficient, please charge any fees due or credit any overpayment to Deposit Account No. 50-0694.

Respectfully submitted,

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I hereby certify that this paper (7 pages total) is being facsimile transmitted to the Commissioner of Patents and Trademarks at (571) 273-8300 on the date shown below.

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